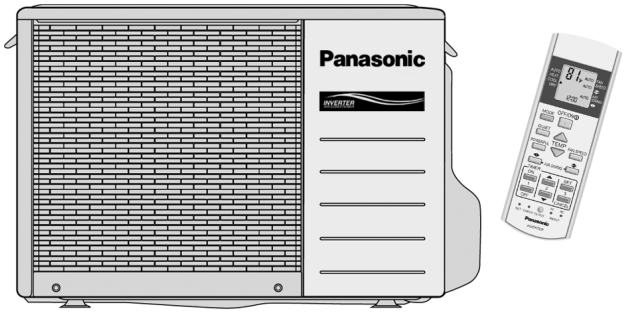
Order No: MAC0512115C1

Service Manual

Air Conditioner



CS-E18EKU CU-E18EKU
CS-E21EKU CU-E21EKU

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

⚠ PRECAUTION OF LOW TEMPERATURE

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigeration circuit.

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1 Safety Precautions

- Read the following “SAFETY PRECAUTIONS” carefully before perform any servicing.
- Electrical work must be installed or serviced by a licensed electrician. Be sure to use the correct rating of the power plug and main circuit for the model installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below.

  Incorrect installation or servicing due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.

⚠ WARNING	This indication shows the possibility of causing death or serious injury.

⚠ CAUTION	This indication shows the possibility of causing injury or damage to properties.

- The items to be followed are classified by the symbols:

	This symbol denotes item that is PROHIBITED from doing.

- Carry out test running to confirm that no abnormality occurs after the servicing. Then, explain to user the operation, care and maintenance as stated in instructions. Please remind the customer to keep the operating instructions for future reference.

⚠ WARNING	
1. Engage dealer or specialist for installation and servicing. If installation or servicing done by the user is defective, it will cause water leakage, electrical shock or fire.	
2. Install according to this installation instruction strictly. If installation is defective, it will cause water leakage, electrical shock or fire.	
3. Use the attached accessories parts and specified parts for installation and servicing. Otherwise, it will cause the set to fall, water leakage, fire or electrical shock.	
4. Install at a strong and firm location which is able to withstand the set’s weight. If the strength is not enough or installation is not properly done, the set will drop and cause injury.	
5. For electrical work, follow the local national wiring standard, regulation and the installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire.	
6. Use the specified cable and connect tightly for indoor/outdoor connection. Connect tightly and clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat-up or fire at the connection.	
7. Wire routing must be properly arranged so that control board cover is fixed properly. If control board cover is not fixed perfectly, it will cause heat-up at connection point of terminal, fire or electrical shock.	
8. When connecting the piping, do not allow air or any substances other than the specified refrigerant to enter the refrigeration cycle. Otherwise, this may lower the capacity, cause abnormally high pressure in the refrigeration cycle, and possibly result in explosion and injury.	
9. Thickness of copper pipes used must be more than 10/32 inches. Never use copper pipes thinner than 10/32 inches.	
10. It is desirable that the amount of residual oil is less than 40 mg/10 m.	
11. Do not modify the length of the power supply cord or use of the extension cord, and do not share the single outlet with other electrical appliances. Otherwise, it will cause fire or electrical shock.	

⚠ CAUTION

1. The equipment must be earthed. It may cause electrical shock if grounding is not perfect.
2. Do not install the unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.

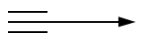
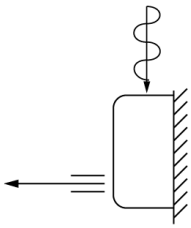
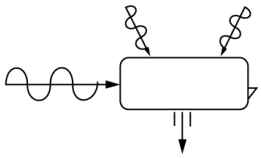
3. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.
4. Pb free solder has a higher melting point than standard solder; typically the melting point is 50 - 70°F (30 - 40°C) higher. Please use a high temperature soldering iron. In case of the soldering iron with temperature control, please set it to 700 ± 20°F (370 ± 10°C).
   Pb free solder will tend to splash when heated too high (about 1100°F/600°C).

ATTENTION

1. Selection of the installation location. Select an installation location which is rigid and strong enough to support or hold the unit, and select a location for easy maintenance.
2. Power supply connection to the air conditioner. Connect the power supply cord of the air conditioner to the mains using one of the following methods. Power supply point shall be the place where there is ease for access for the power disconnection in case of emergency.
   In some countries, permanent connection of this room air conditioner to the power supply is prohibited.
   1. Power supply connection to the receptacle using a power plug. Use an approved power plug with earth pin for the connection to the socket.
   2. Power supply connection to a circuit breaker for the permanent connection. Use an approved circuit breaker for the permanent connection. It must be a double pole switch with a minimum 4/32 inches contact gap.
3. Do not release refrigerant during piping work for installation, servicing, reinstallation and during repairing a refrigeration parts. Take care of the liquid refrigerant, it may cause frostbite.
4. Installation work. It may need two people to carry out the installation work.
5. Do not install this appliance in a laundry room or other location where water may drip from the ceiling, etc.

2 Specification

2.1. CS-E18EKU CU-E18EKU

		Unit	CS-E18EKU	CU-E18EKU
Performance Test Condition			CSA	
Cooling Capacity		kW BTu/h	5.20 (1.30 - 5.80) 17,700 (4,400 - 19,700)	
Heating Capacity		kW BTu/h	6.30 (1.30 - 7.70) 21,400 (4,400 - 19,700)	
Moisture Removal		l/h Pint/h	1.8 3.8	
Power Source (Phase, Voltage, Cycle)		ø V Hz	Single 208 - 230 60	
Airflow Method		OUTLET  INTAKE 	SIDE VIEW 	TOP VIEW 
Air Volume	Lo	m^3/min (cfm)	Cooling; 11.0 (389) Heating; 12.3 (443)	—
	Me	m^3/min (cfm)	Cooling; 12.2 (432) Heating; 14.1 (497)	—
	Hi	m^3/min (cfm)	Cooling; 13.5 (480) Heating; 15.9 (560)	Cooling; 40.0 (1,410) Heating; 40.0 (1,410)
	SHi	m^3/min (cfm)	—	—
Noise Level		dB (A)	Cooling; High 45, Low 39 Heating; High 46, Low 39	Cooling; 47 - 47 Heating; 47 - 47
		Power level dB	Cooling; High 58 - 58 Heating; High 59 - 59	Cooling; High 60 - 60 Heating; High 60 - 60
Electrical Data	Input	W	Cooling; 1.60k (250 - 1.8k) Heating; 1.85k (250 - 2.50k)	
	Running Current	A	Cooling; 7.9 Heating; 9.2	
	EER	W/W (kcal/hw)	Cooling; 3.25 (11.06)	
	COP	W/W (kcal/hw)	Heating; 3.41 (11.57)	
	Starting Current	A	9.2	
SEER/HSPF		W/W	16.50	7.70
Piping Connection Port (Flare piping)		inch inch	G ; Half Union 1/2” L ; Half Union 1/4”	G ; 3-way valve 1/2” L ; 2-way valve 1/4”
Pipe Size (Flare piping)		inch inch	G (gas side) ; 1/2” L (liquid side) ; 1/4”	G (gas side) ; 1/2” L (liquid side) ; 1/4”
Drain Hose	Inner diameter	inch	20/32”	—
	Length	inch	25 - 19/32”	—

			Unit	CS-E18EKU	CU-E18EKU
Power Cord Length Number of core-wire			inch	70 - 29/32" (1.5mm^2)	— —
Dimensions	Height		inch (mm)	10 - 13/16 (275)	29 - 17/32 (750)
	Width		inch (mm)	39 - 9/32 (998)	34 - 7/16 (875)
	Depth		inch (mm)	9 - 1/16 (230)	13 - 19/32 (345)
Net Weight			lb (kg)	24 (11.0)	108 (49.0)
Compressor		Type		—	Hermetic Motor
	Motor	Type		—	Brushless (4-pole)
	Rated	Output	W	—	900
Fan Motor		Type		Cross-flow Fan	Propeller Fan
		Material		ASHT-18	P.P
	Motor	Type		Transistor (8-poles)	PWM (8-poles)
		Input	W	61.6	62.1
		Rate Output	W	30	40
	Fan Speed	Lo (Cool/Heat)	rpm	1,190/1,280	—
		Me (Cool/Heat)	rpm	1,325/1,470	—
		Hi (Cool/Heat)	rpm	1,460/1,660	660/640
		SHi (Cool/Heat)	rpm	—	—
Heat Exchanger	Description			Evaporator	Condenser
	Tube material			Copper	Copper
	Fin material			Aluminium (Pre Coat)	Aluminium (Blue Coat)
	Fin Type			Slit Fin	Corrugated Fin
	Row / Stage			(Plate fin configuration, forced draft)	
				2 / 15	2 / 34
	FPI			21	16
	Size (W × H × L)		inch	2 - 1/32 × 1 - 13/32 × 1	1 - 14/32 × 19 - 27/32 × 33 - 2/32 34 - 2/32
Refrigerant Control Device				—	Capillary Tube
Refrigeration Oil			(inch^3)	—	RB68A (24.4)
Refrigerant (R410A)			g (oz)	—	930 (32.8)
Thermostat				Electronic Control	—
Protection Device				—	Electronic Control
Air Filter	Material Style			P.P. Honeycomb	—

- Specifications are subjected to change without prior notice for further improvement.

2.2. CS-E21EKU CU-E21EKU

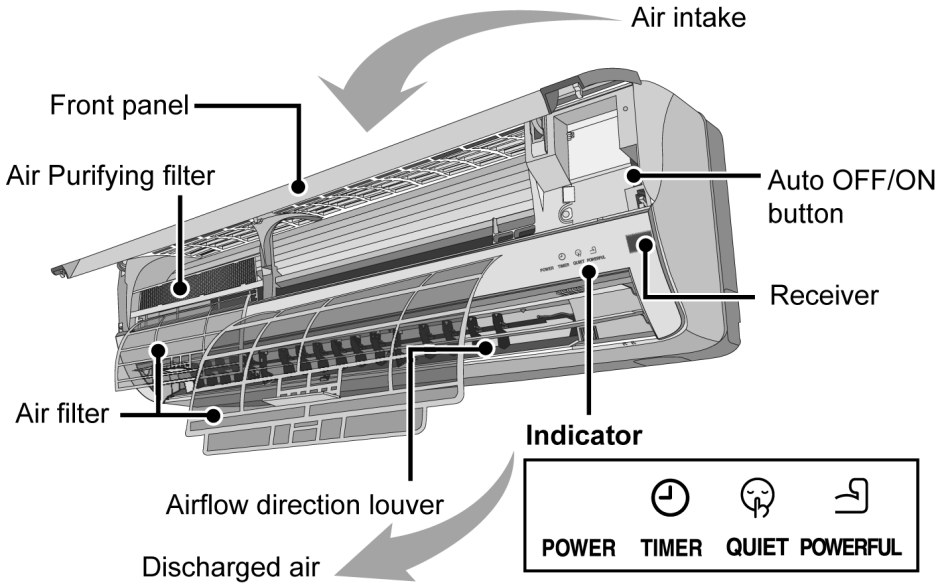
		Unit	CS-E21EKU	CU-E21EKU
Performance Test Condition			CSA	
Cooling Capacity		kW BTu/h	6.10 (1.30 - 6.85) 20,800 (4,400 - 23,400)	
Heating Capacity		kW BTu/h	6.90 (1.30 - 8.30) 23,400 (4,400 - 28,200)	
Moisture Removal		l/h Pint/h	2.6 5.5	
Power Source (Phase, Voltage, Cycle)		ø V Hz	Single 208 - 230 60	
Airflow Method		OUTLET INTAKE	SIDE VIEW	TOP VIEW
Air Volume	Lo	m^3/min (cfm)	Cooling; 11.4 (404) Heating; 12.6 (445)	—
	Me	m^3/min (cfm)	Cooling; 13.1 (462) Heating; 14.5 (513)	—
	Hi	m^3/min (cfm)	Cooling; 14.7 (520) Heating; 16.5 (580)	Cooling; 42.8 (1,510) Heating; 41.5 (1,460)
	SHi	m^3/min (cfm)	—	—
Noise Level		dB (A)	Cooling; High 46, Low 39 Heating; High 47, Low 39	Cooling; 48 - 48 Heating; 49 - 49
		Power level dB	Cooling; High 59 Heating; High 60	Cooling; High 61 Heating; High 62
Electrical Data	Input	W	Cooling; 2.15k (250 - 2.45k) Heating; 2.15k (250 - 2.60k)	
	Running Current	A	Cooling; 10.7 - 9.7 Heating; 10.7 - 9.7	
	EER	W/W (kcal/hw)	Cooling; 2.84 (9.67)	
	COP	W/W (kcal/hw)	Heating; 3.21 (10.88)	
	Starting Current	A	10.7	
SEER/HSPF		W/W	16.50	7.70
Piping Connection Port (Flare piping)		inch inch	G ; Half Union 1/2” L ; Half Union 1/4”	G ; 3-way valve 1/2” L ; 2-way valve 1/4”
Pipe Size (Flare piping)		inch inch	G (gas side) ; 1/2” L (liquid side) ; 1/4”	G (gas side) ; 1/2” L (liquid side) ; 1/4”
Drain Hose	Inner diameter	inch	20/32”	—
	Length	inch	25 - 19/32”	—
Power Cord Length Number of core-wire			70 - 29/32” (1.5mm^2)	— —

			Unit	CS-E21EKU	CU-E21EKU
Dimensions	Height		inch (mm)	10 - 13/16 (275)	29 - 17/32 (750)
	Width		inch (mm)	39 - 9/32 (998)	34 - 7/16 (875)
	Depth		inch (mm)	9 - 1/16 (230)	13 - 19/32 (345)
Net Weight			lb (kg)	20 (9.0)	79 (36)
Compressor		Type		—	Hermetic Motor
	Motor	Type		—	Brushless (4-pole)
	Rated	Output	W	—	900
Fan Motor		Type		Cross-flow Fan	Propeller Fan
		Material		ASHT-18	P.P
	Motor	Type		Transistor (8-poles)	PWM (8-poles)
		Input	W	61.6	74.8
		Rate Output	W	30	40
	Fan Speed	Lo (Cool/Heat)	rpm	1,200/1,290	—
		Me (Cool/Heat)	rpm	1,370/1,490	—
		Hi (Cool/Heat)	rpm	1,540/1,690	700 / 680
		SHi (Cool/Heat)	rpm	—	—
Heat Exchanger	Description			Evaporator	Condenser
	Tube material			Copper	Copper
	Fin material			Aluminium (Pre Coat)	Aluminium (Blue Coat)
	Fin Type			Slit Fin	Corrugated Fin
	Row / Stage			(Plate fin configuration, forced draft)	
				2 / 15	2 / 34
	FPI			21	18
	Size (W × H × L)		inch	2 - 1/32 × 1 - 13/32 × 1	1 - 14/32 × 19 - 27/32 × 33 - 2/32 34 - 2/32
Refrigerant Control Device				—	Capillary Tube
Refrigeration Oil			($inch^3$)	—	RB68A (24.4)
Refrigerant (R410A)			g (oz)	—	1.29k (45.5)
Thermostat				Electronic Control	—
Protection Device				—	Electronic Control
Air Filter	Material Style			P.P. Honeycomb	—

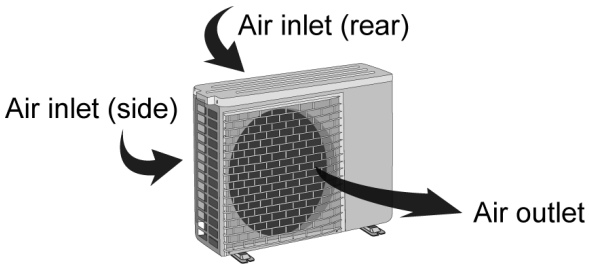
- Specifications are subjected to change without prior notice for further improvement.

3 Location of controls and components

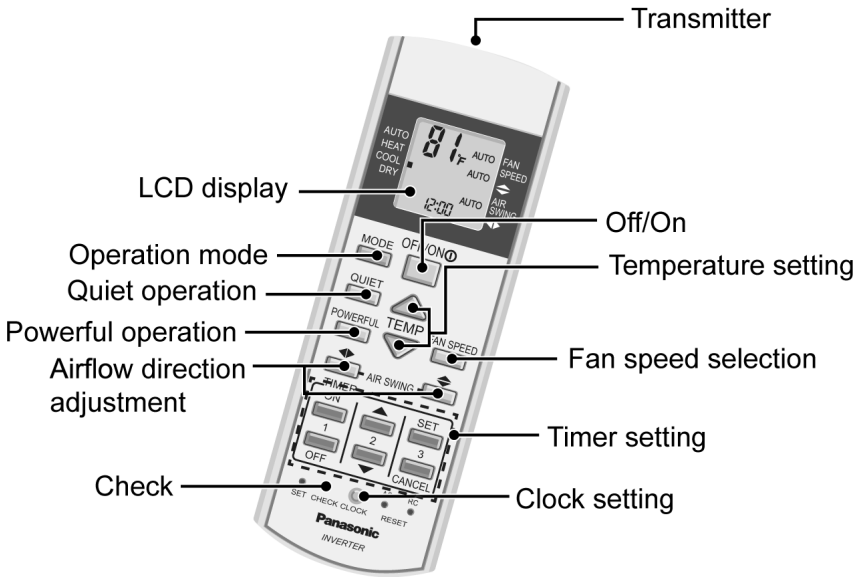
3.1. Indoor Unit



3.2. Outdoor Unit

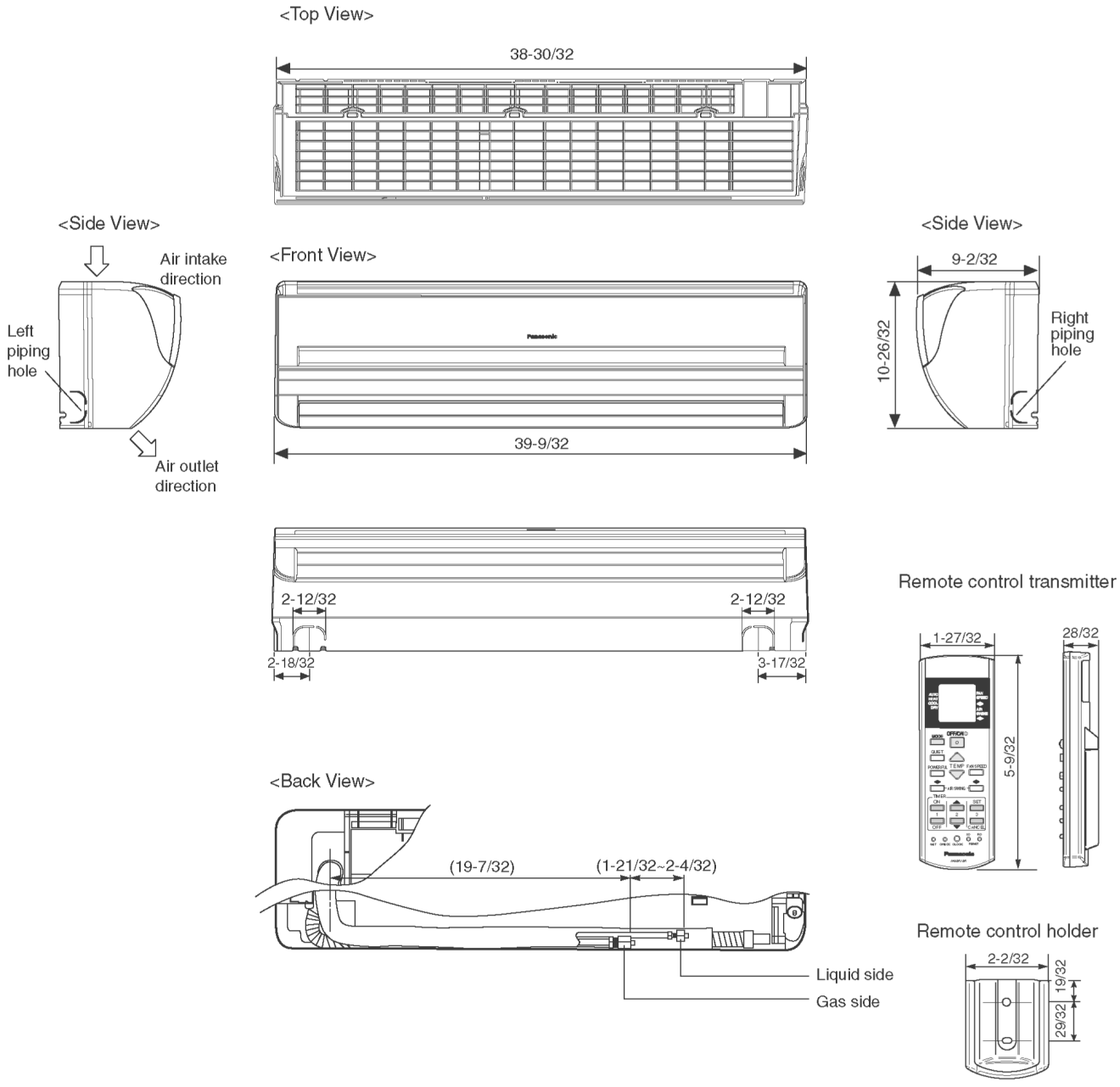


3.3. Remote Control

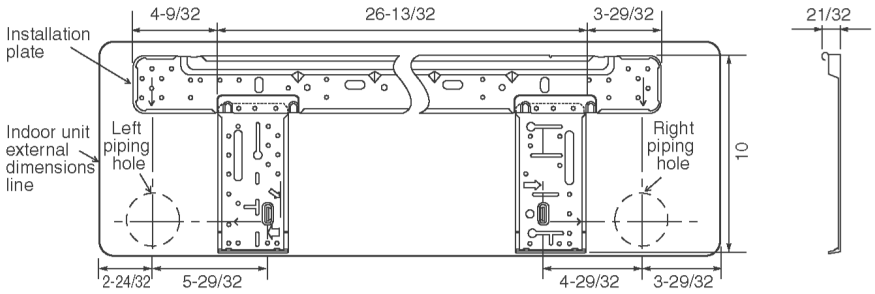


4 Dimension

4.1. Indoor Unit & Remote Control

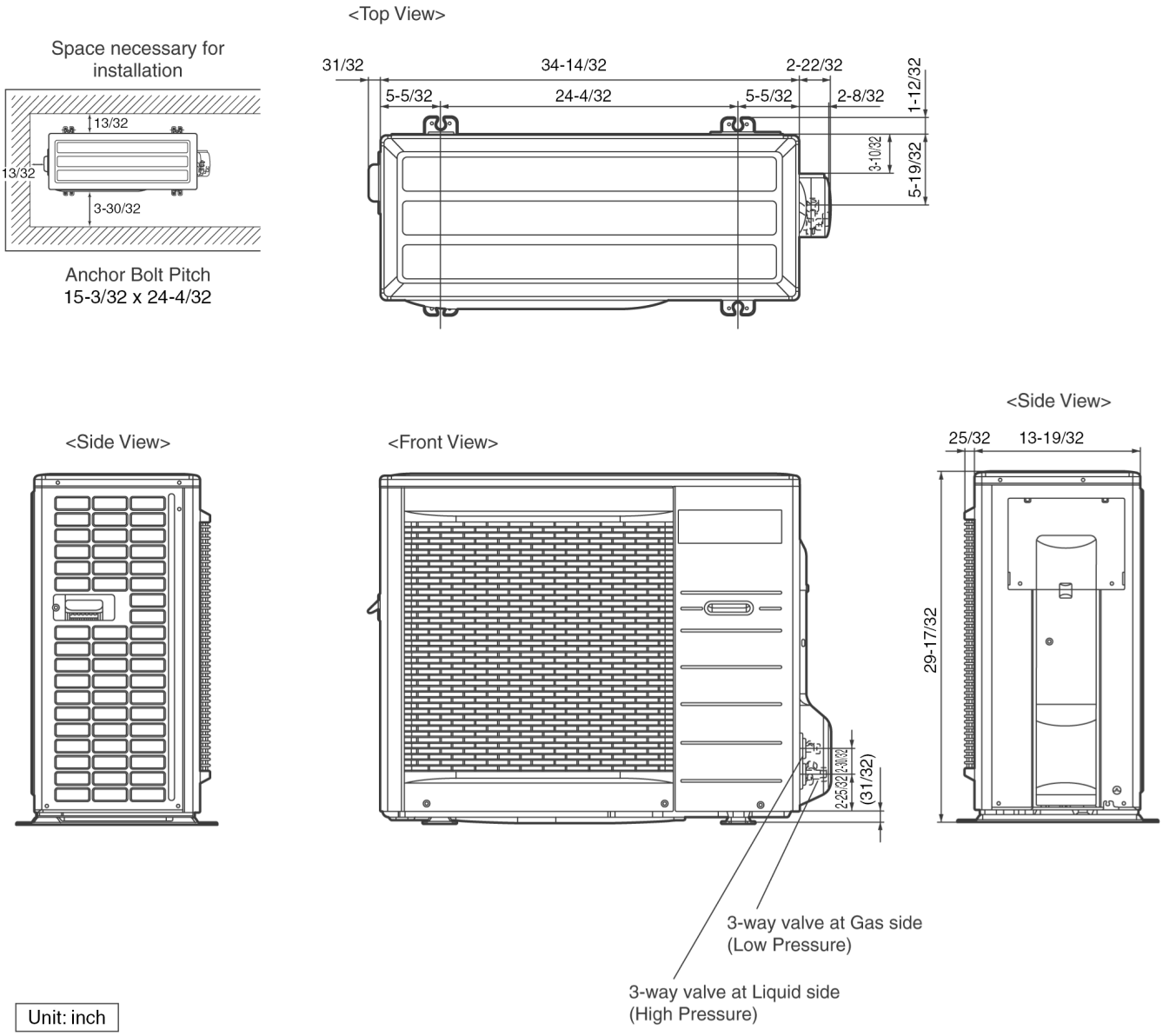


Relative position between the indoor unit and the installation plate <Front View>



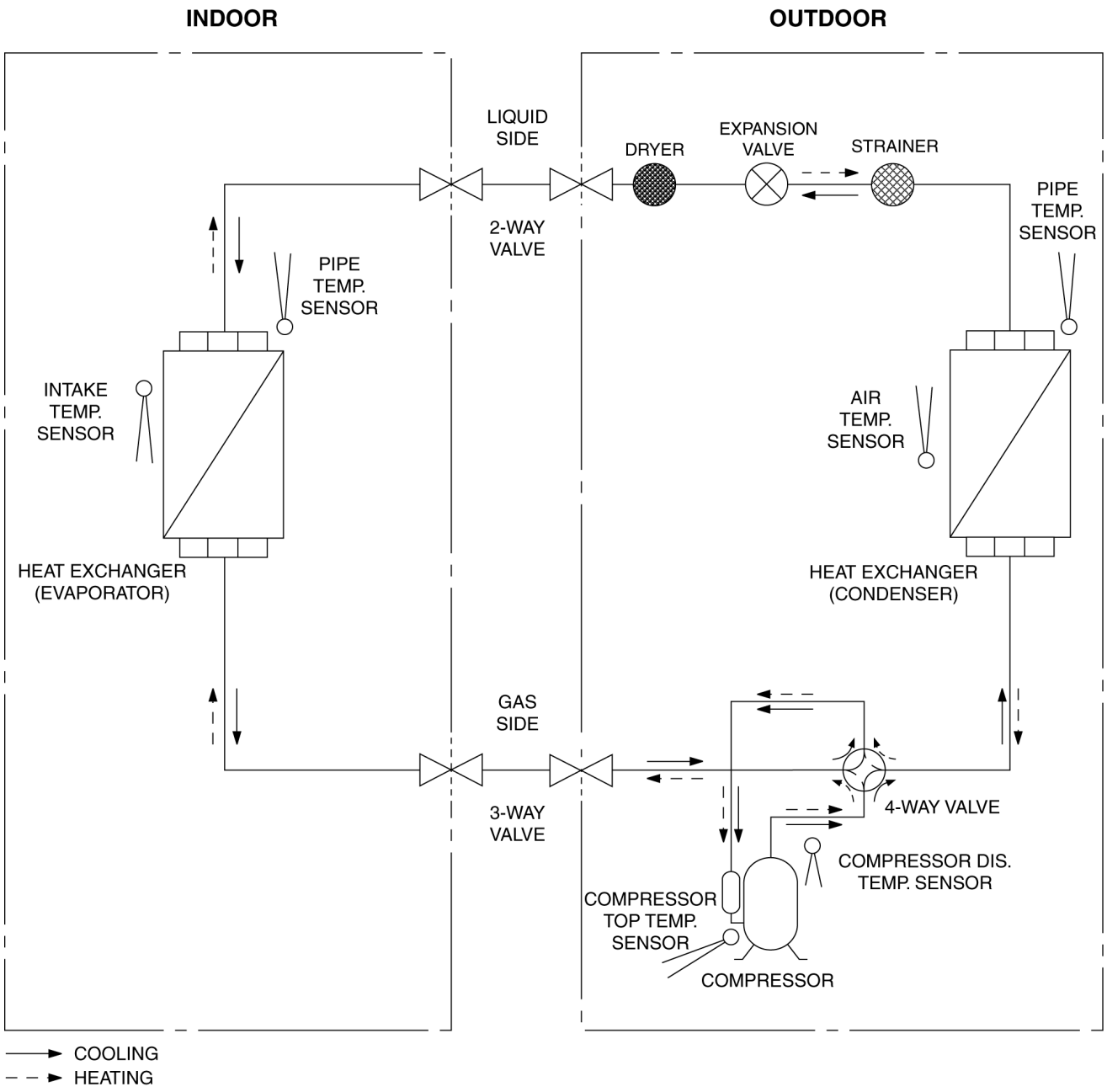
Unit : inch

4.2. Outdoor Unit

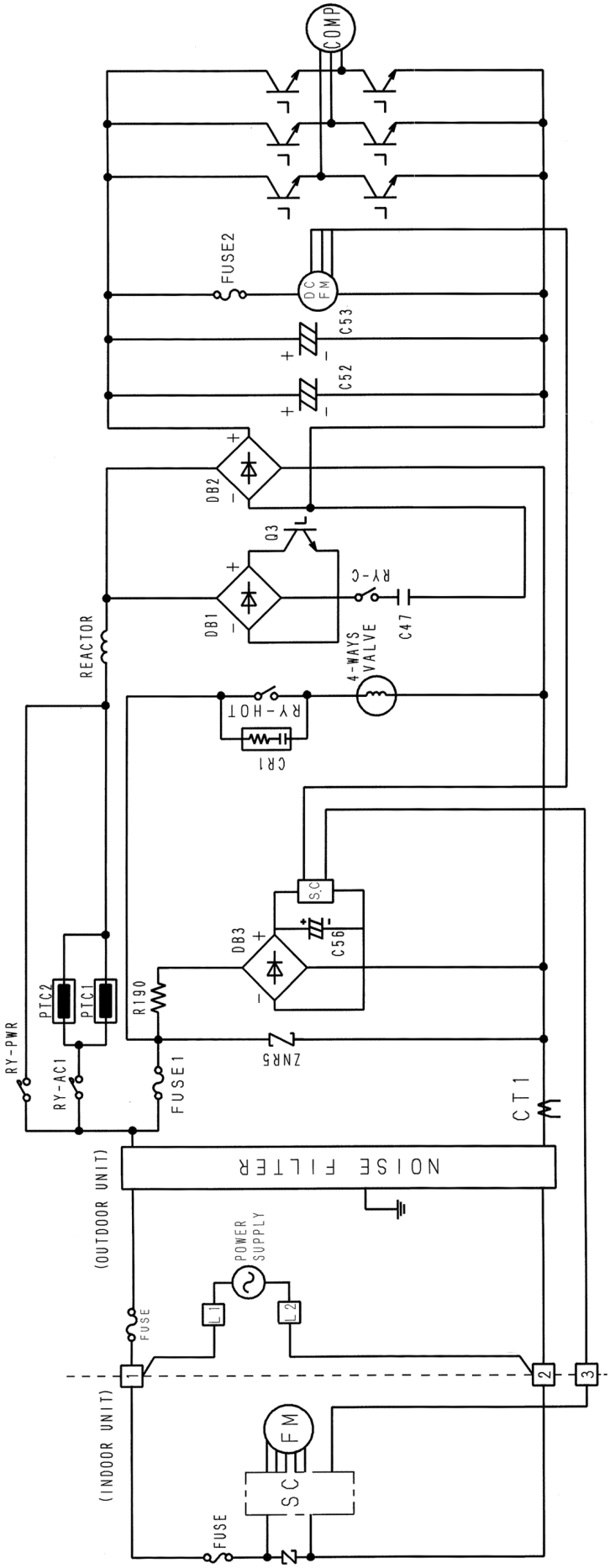


Unit: inch

5 Refrigeration Cycle Diagram

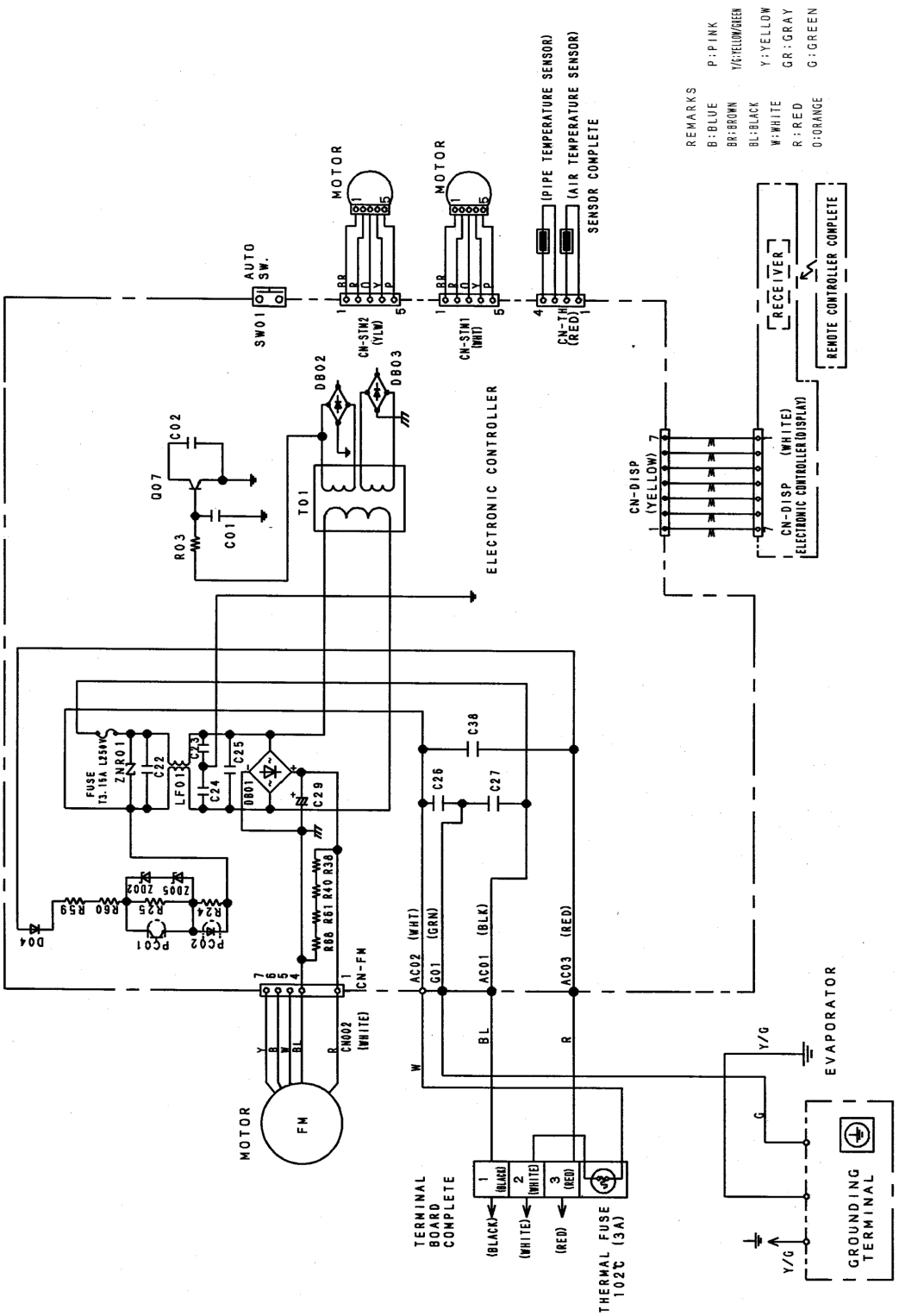


6 Block Diagram

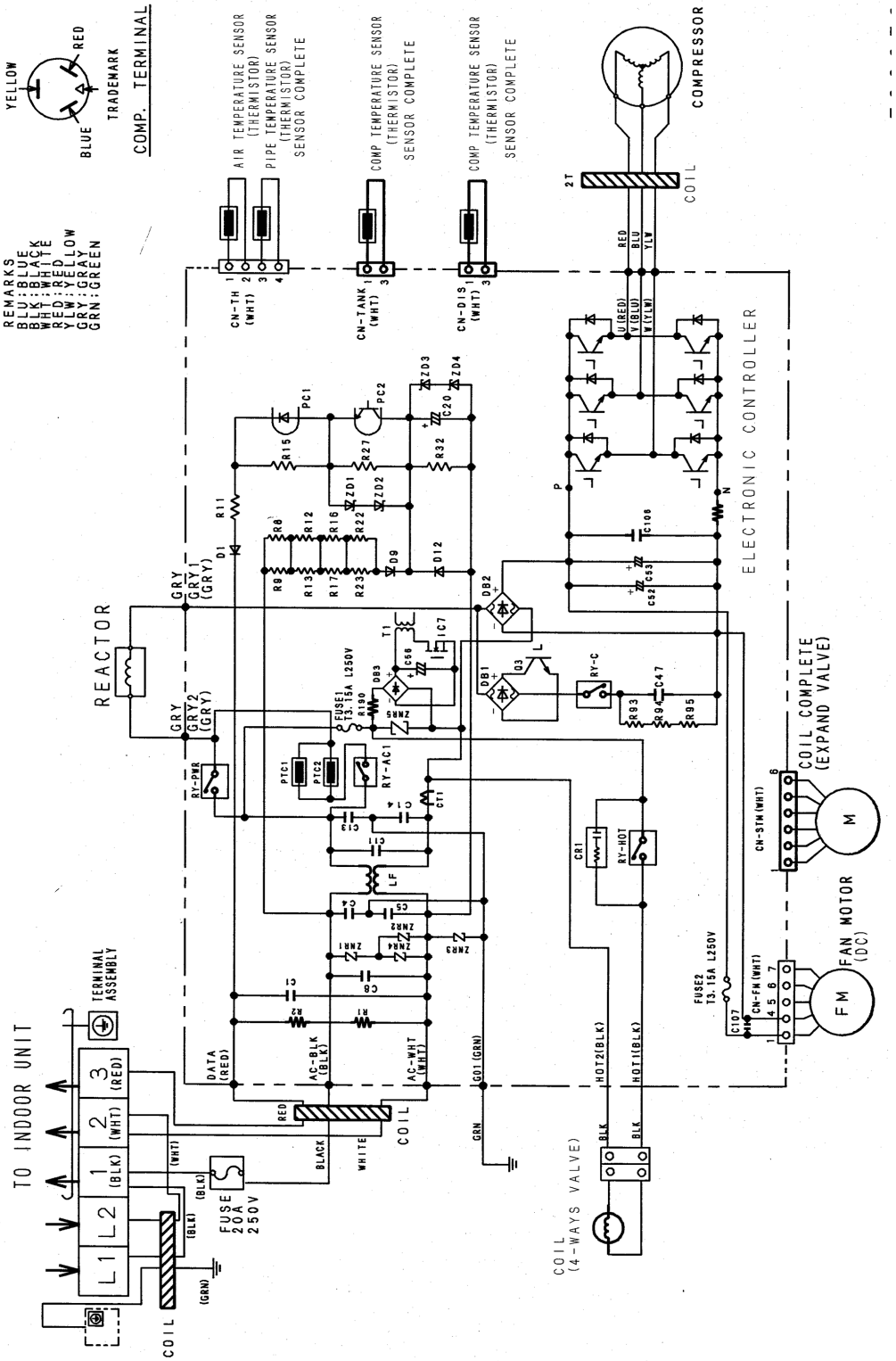


7 Wiring Diagram

7.1. CS-E18EKU CS-E21EKU



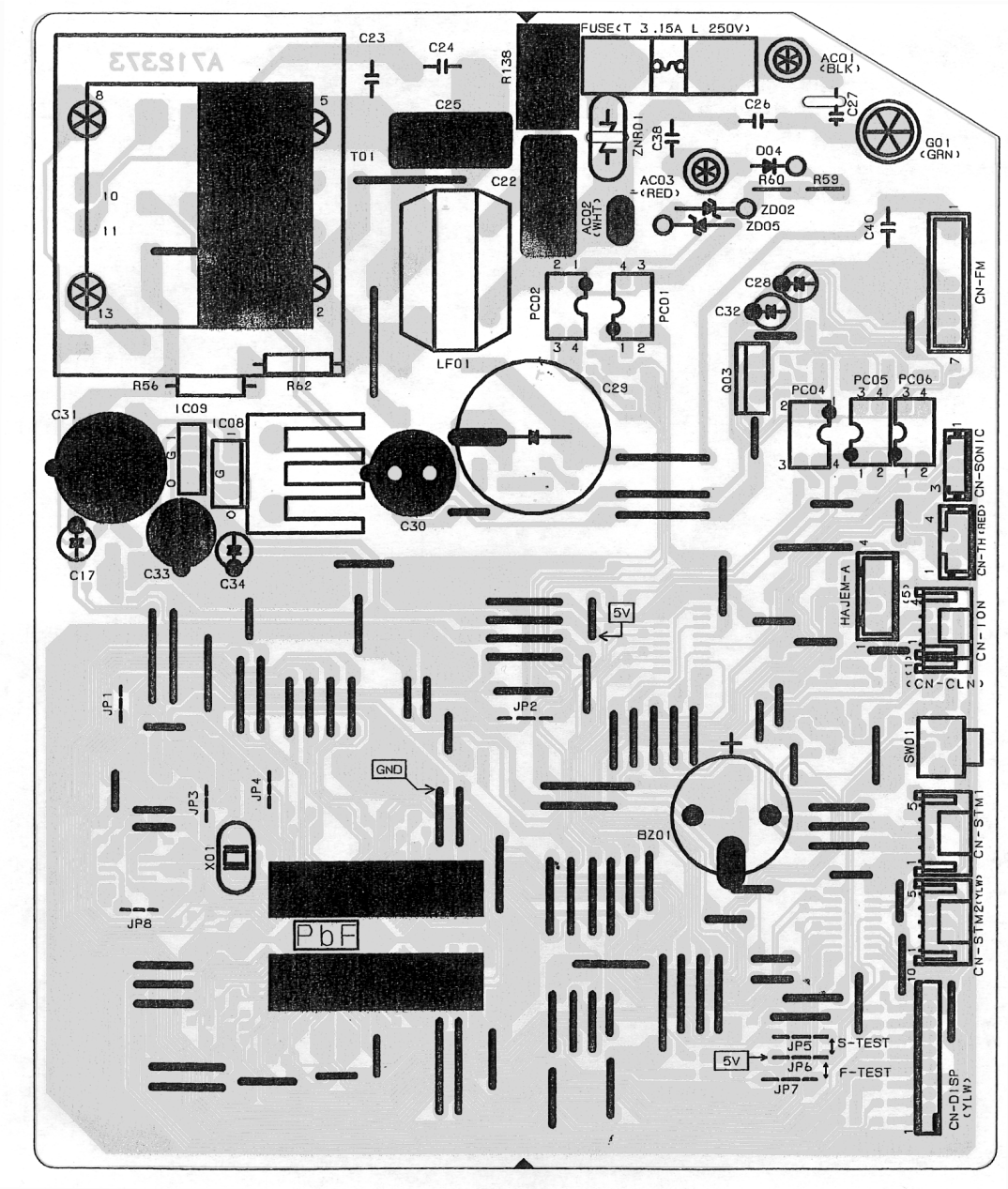
7.2. CU-E18EKU CU-E21EKU



8 Printed Circuit Board

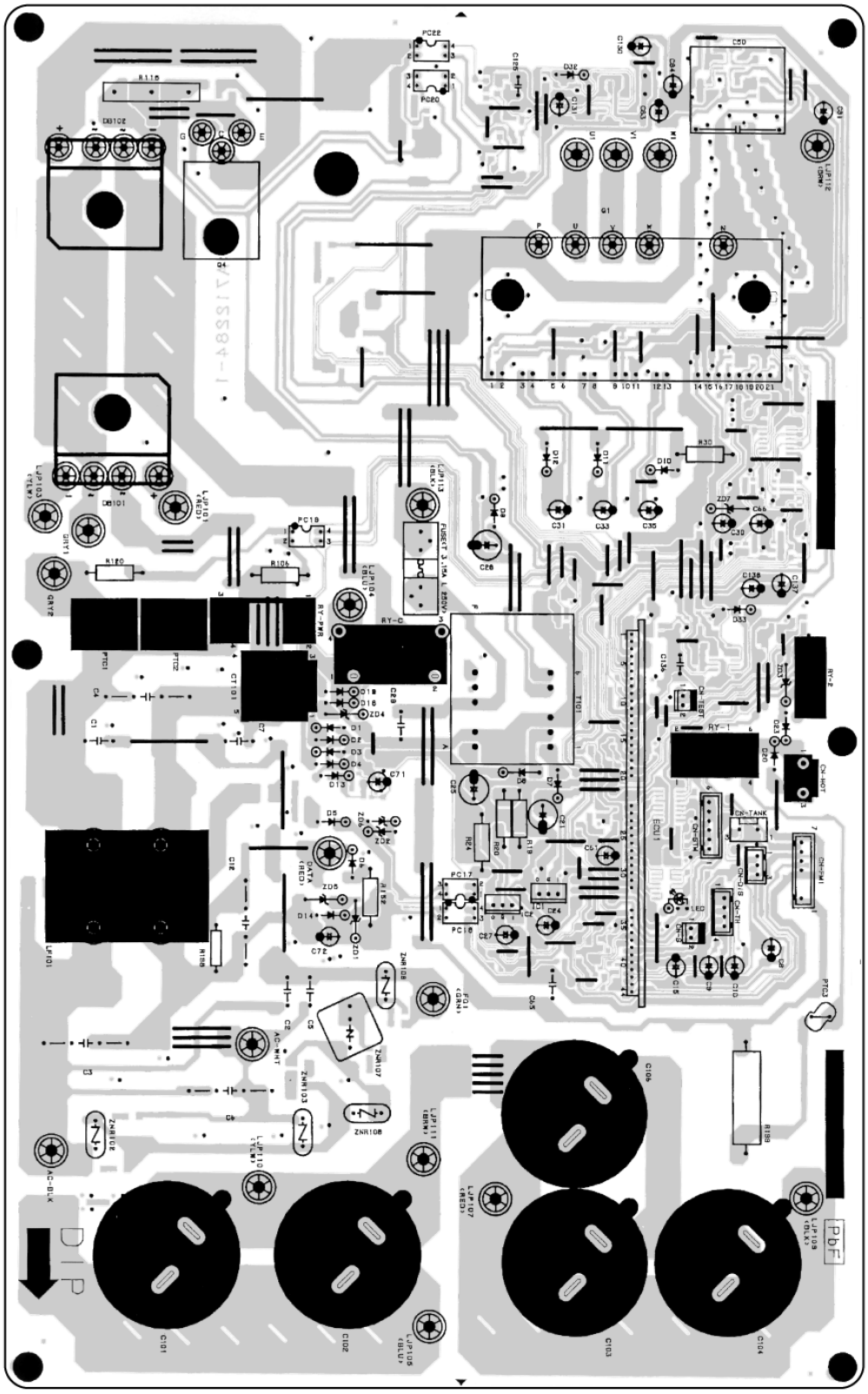
8.1. Indoor Unit

● MAIN



8.2. Outdoor Unit

● **MAIN**



9 Installation Instructions

9.1. Select The Best Location

INDOOR UNIT

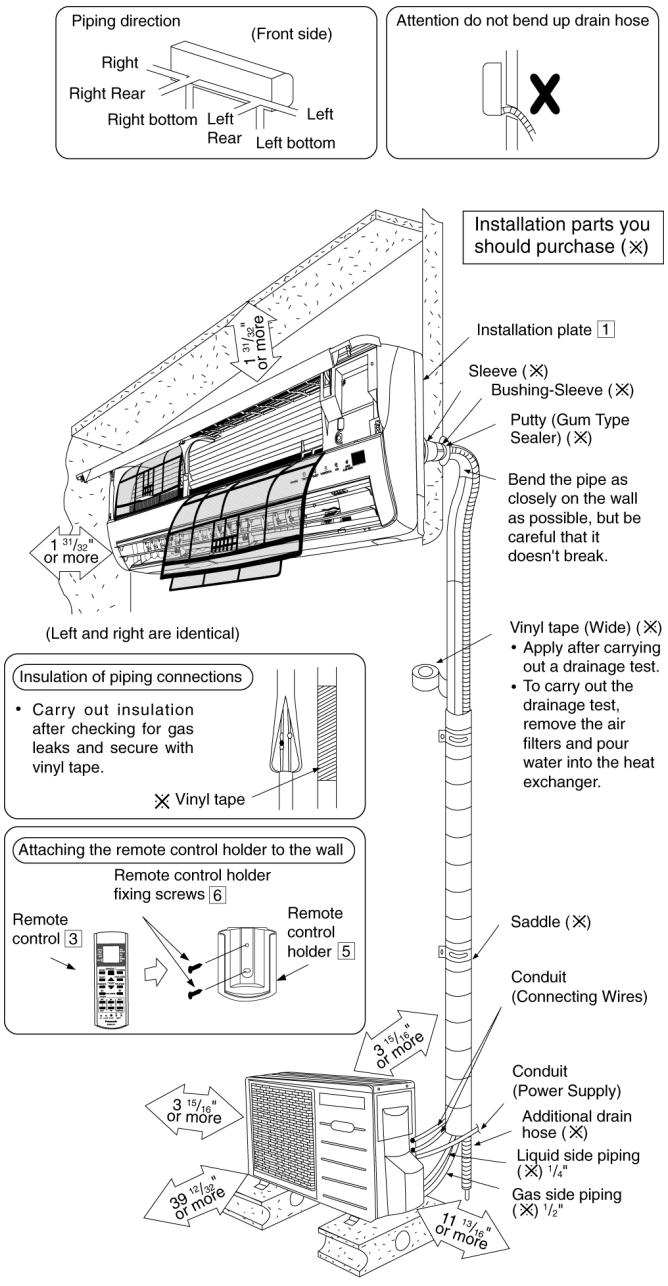
- There should not be any heat source or steam near the unit.
- There should not be any obstacles blocking the air circulation.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.
- Recommended installation height for indoor unit shall be at least 8'2".

OUTDOOR UNIT

- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should not be any animal or plant which could be affected by hot air discharged.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If piping length is over the rated length, additional refrigerant should be added as shown in the table.

Model	Piping size		Rated Length	Max. Elevation	Max. Piping Length	Additional Refrigerant
	Gas	Liquid				
E18EK E21EK	1/2"	1/4"	16.4ft (5m)	49.2ft (15m)	65.6ft (20m)	0.22oz/ft (20g/m)

Indoor/Outdoor Unit Installation Diagram

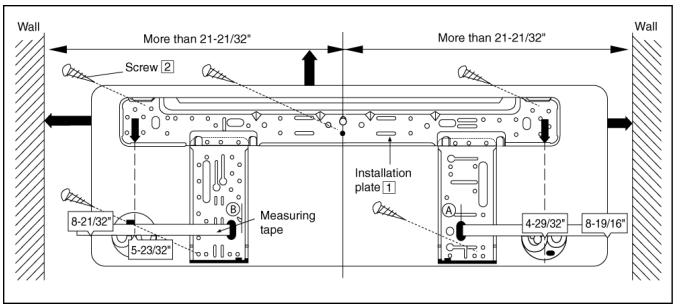

Piping direction
(Front side)
Right
Right Rear
Right bottom
Left
Rear
Left
Left bottom
Attention do not bend up drain hose
Installation parts you should purchase (※)
1 31/32" or more
Installation plate 1
Sleeve (※)
Bushing-Sleeve (※)
Putty (Gum Type Sealer) (※)
Bend the pipe as closely on the wall as possible, but be careful that it doesn't break.
(Left and right are identical)
Insulation of piping connections
• Carry out insulation after checking for gas leaks and secure with vinyl tape.
※ Vinyl tape
Vinyl tape (Wide) (※)
• Apply after carrying out a drainage test.
• To carry out the drainage test, remove the air filters and pour water into the heat exchanger.
Attaching the remote control holder to the wall
Remote control holder fixing screws 6
Remote control 3
Remote control holder 5
Saddle (※)
Conduit (Connecting Wires)
3 15/16" or more
Conduit (Power Supply)
Additional drain hose (※)
Liquid side piping (※) 1/4"
Gas side piping (※) 1/2"
39 12/32" or more
11 13/16" or more

- This illustration is for explanation purposes only. The indoor unit will actually face a different way.

9.2. Indoor Unit

9.2.1. HOW TO FIX INSTALLATION PLATE

The mounting wall is strong and solid enough to prevent it from the vibration.



The wall must be able to withstand the weight of the unit.

The centre of installation plate should be at more than 21-21/32” at right and left of the wall.

The distance from installation plate edge to ceiling should more than 2-5/8”.

From installation plate left edge to unit’s left side is 1-27/32”.

From installation plate right edge to unit’s right is 2-7/8”.

Ⓑ : For left side piping, piping connection for liquid should be about 4-31/32” from this line.
: For left side piping, piping connection for gas should be about 6-27/32” from this line.
: For left side piping, piping connection cable should be about 38-3/4” from this line.

1. Mount the installation plate on the wall with 5 screws or more.
   (If mounting the unit on the concrete wall consider using anchor bolts.)
   - Always mount the installation plate horizontally by aligning the marking-off line with the thread and using a level gauge.

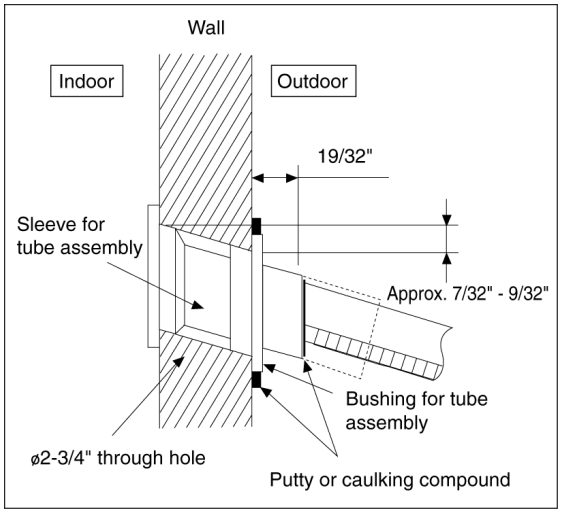
2. Drill the piping plate hole with ø2-3/4” hole-core drill.
   - Line according to the arrows marked on the lower left and right side of the installation plate. The meeting point of the extended line is the centre of the hole. Another method is to put measuring tape at position as shown in the diagram above. The hole centre is obtained by measuring the distance namely 5-29/32” and 4-29/32” for left and right hole respectively.
   - Drill the piping hole at either the right or the left and the hole should be slightly slanted to the outdoor side.

9.2.2. TO DRILL A HOLE IN THE WALL AND INSTALL A SLEEVE OF PIPING

1. Insert the piping sleeve to the hole.
2. Fix the bushing to the sleeve.
3. Cut the sleeve until it extrudes about 19/32” from the wall.

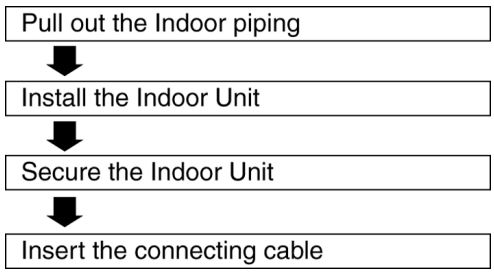
Caution
When the wall is hollow, please be sure to use the sleeve for tube assembly to prevent dangers caused by mice biting the connecting cable.

4. Finish by sealing the sleeve with putty or caulking compound at the final stage.

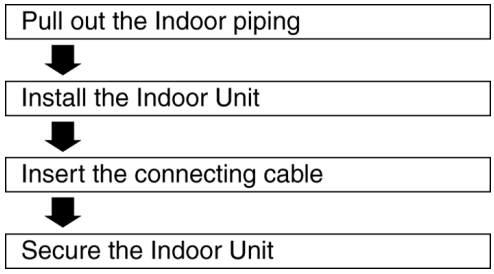


9.2.3. INDOOR UNIT INSTALLATION

1. **For the right rear piping**



2. **For the right and right bottom piping**



3. For the embedded piping

Replace the drain hose

↓

Bend the embedded piping

↓

- Use a spring bender or equivalent to bend the piping so that the piping is not crushed.

Install the Indoor Unit

↓

Cut and flare the embedded piping

↓

- When determing the dimensions of the piping, slide the unit all the way to the left on the installation plate.
- Refer to the section "Cutting and flaring the piping".

Pull the connecting cable into Indoor Unit

↓

- The inside and outside connecting cable can be connected without removing the front grille.

Connect the piping

↓

- Please refer to "Connecting the piping" column in outdoor unit section. (Below steps are done after connecting the outdoor piping and gas-leakage confirmation.)

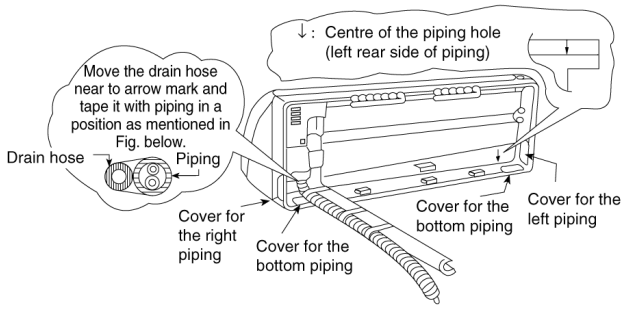
Insulate and finish the piping

↓

- Please refer to "Piping and finishing" column of outdoor section and "Insulation of piping connections" column as mentioned in Indoor/ Outdoor Unit Installation.

Secure the Indoor Unit

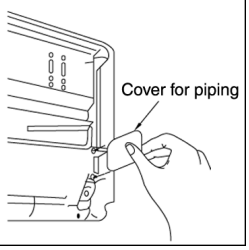
Pull out the piping and drain hose


↓: Centre of the piping hole (left rear side of piping)
Move the drain hose near to arrow mark and tape it with piping in a position as mentioned in Fig. below.
Drain hose
Piping
Cover for the right piping
Cover for the bottom piping
Cover for the bottom piping
Cover for the left piping

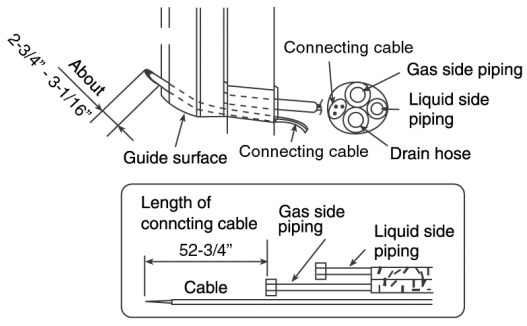
How to keep the cover

In case of the cover is cut, keep the cover at the rear of chassis as shown in the illustration for future reinstallation.

(Left, right and 2 bottom covers for piping)

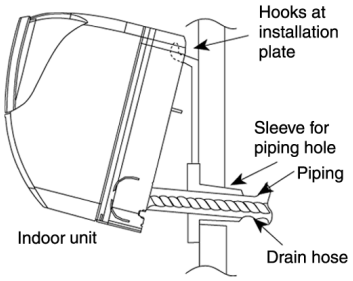


Insert the connecting cable



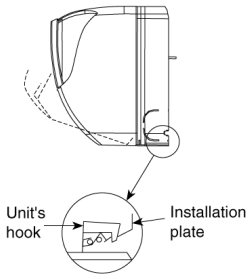
Install the Indoor Unit

Hook the indoor unit onto the upper portion of installation plate (Engage the indoor unit with the upper edge of the installation plate). Ensure the hooks are properly seated on the installation plate by moving it in left and right.

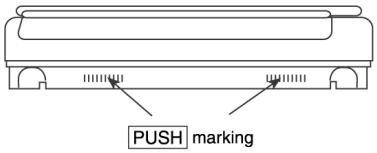


Secure the Indoor Unit

1. Press the lower left and right side of the unit against the installation plate until hooks engages with their slot (sound click).



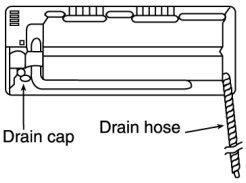
To take out the unit, push the PUSH marking at the bottom unit, and pull it slightly towards you to disengage the hooks from the unit.

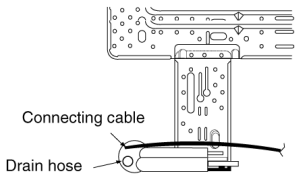


(This can be used for left rear piping and left bottom piping also.)

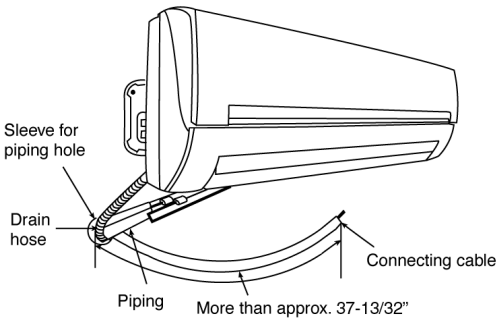
Exchange the drain hose and the cap

Refer view for left piping installation

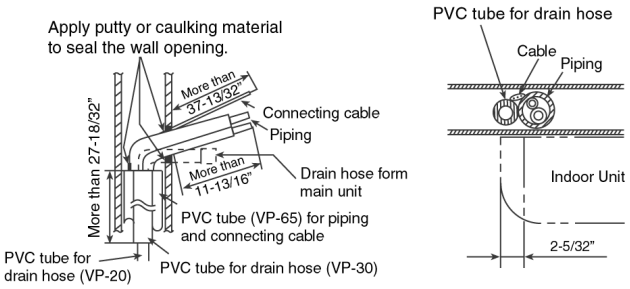




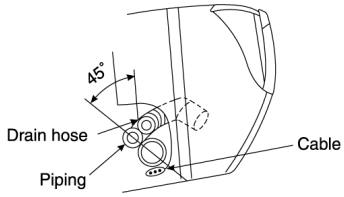
Adjust the piping slightly downwards



- How to pull the piping and drain hose out, in case of the embedded piping.



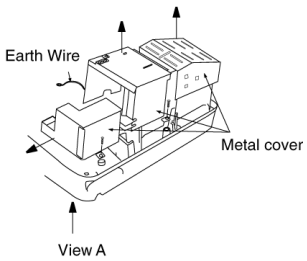
- In case of left piping how to insert the connecting cable and drain hose.



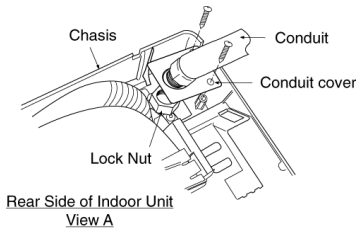
(For the right piping, follow the same procedure)

9.2.4. INDOOR UNIT ELECTRICAL WIRING

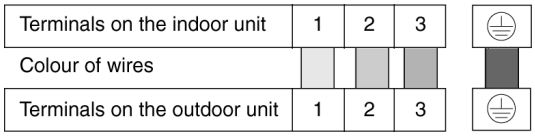
1. Remove the control board metal cover.



2. Unscrew the conduit cover & fix the conduit connector to conduit cover with lock nut, then secure it against chassis.

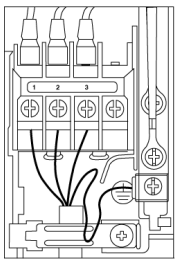


3. Connecting wire between indoor unit and outdoor unit shall be UL listed or CSA approved 4 × AWG16 wire.
   - Ensure the color of wires of outdoor unit and the terminal numbers are the same to the indoor's respectively.
   - Earth lead wire shall be longer than the other lead wires as shown in the figure for the electrical safety in case the slipping out of the cord slips out from the anchorage.

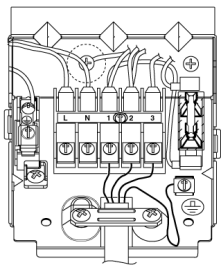


   - Secure the wire onto the control board with the holder (clamper).

Indoor



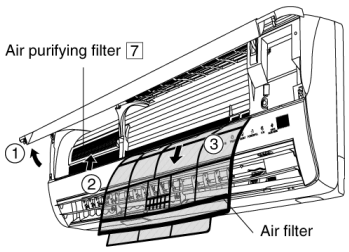
Outdoor



4. After completing wiring connections, reattach the metal cover to the original location.

9.2.5. INSTALLATION OF AIR PURIFYING FILTER

1. Open the front panel.
2. Remove the air filter.
3. Put Air Purifying Filter into place as shown in illustration at right.

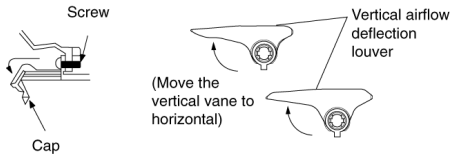


9.2.6. HOW TO TAKE OUT FRONT GRILLE

Please follow the steps below to take out front grille if necessary such as when servicing.

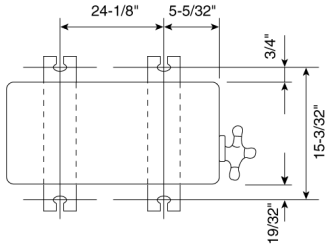
1. Set the vertical airflow direction louvers to the horizontal position.
2. Slide down the 3 caps on the front grille as shown in the illustration below, and then remove the 3 mounting screws.
3. Pull the lower section of the front grille towards you to remove the front grille.

When reinstalling the front grille, first set the vertical airflow direction louvers to the horizontal position and then carry out above steps 2 - 3 in the reverse order.



9.3. Outdoor Unit

9.3.1. INSTALL THE OUTDOOR UNIT



- After selecting the best location, start installation according to Indoor/Outdoor Unit Installation Diagram.

1. Fix the unit on concrete or rigid frame firmly and horizontally by bolt nut (ø13/32").
2. When installing at roof, please consider strong wind and earthquake. Please fasten the installation stand firmly with bolt or nails.

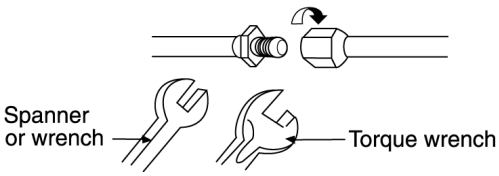
9.3.2. CONNECTING THE PIPING

Connecting The Piping To Indoor Unit

Please make flare after inserting flare nut (locate at joint portion of tube assembly) onto the copper pipe. (In case of using long piping)

Connect the piping

- Align the center of piping and sufficiently tighten the flare nut with fingers.
- Further tighten the flare nut with torque wrench in specified torque as stated in the table.



MODEL	Piping size (Torque)	
	Gas	Liquid
E18EK, E21EK	1/2" (40.6 lbf.ft)	1/4" (13.3 lbf.ft)

Connecting The Piping To Outdoor Unit

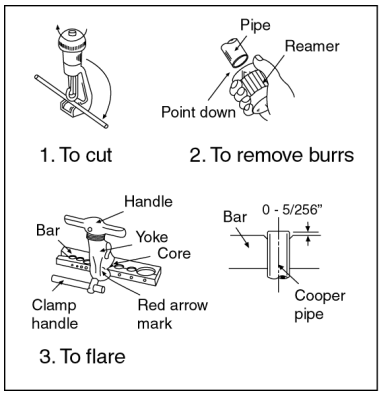
Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (located at valve) onto the copper pipe.

Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.

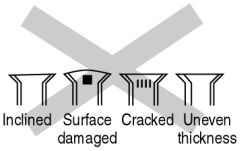
CUTTING AND FLARING THE PIPING

1. Please cut using pipe cutter and then remove the burrs.
2. Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused.

   Turn the piping end down to avoid the metal powder entering the pipe.
3. Please make flare after inserting the flare nut onto the copper pipes.



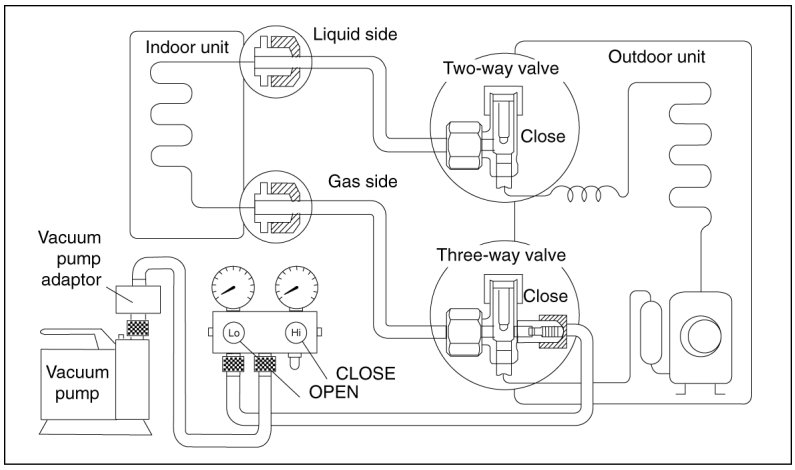
■ Improper flaring ■



When properly flared, the internal surface of the flare will evenly shine and be of even thickness. Since the flare part comes into contact with the connections, carefully check the flare finish.

9.3.3. EVACUATION OF THE EQUIPMENT

WHEN INSTALLING AN AIR CONDITIONER, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.



1. Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.
   - Be sure to connect the end of the charging hose with the push pin to the service port.
2. Connect the center hose of the charging set to a vacuum pump with check valve, or vacuum pump and vacuum pump adaptor.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 PSI to 14.5 PSI. Then evacuate the air approximately ten minutes.
4. Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.

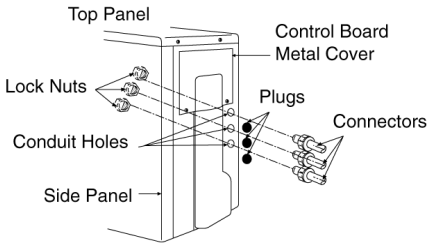
   Note: BE SURE TO FOLLOW THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.
5. Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6. Tighten the service port caps of the 3-way valve at a torque of 13.3 lbf with a torque wrench.
7. Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (5/32”).
8. Mount valve caps onto the 2-way valve and the 3-way valve.
   - Be sure to check for gas leakage.

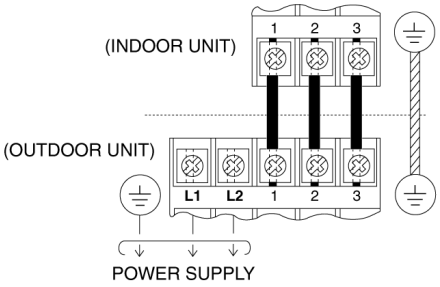
CAUTION

- If gauge needle does not move from 0 PSI - 14.5 PSI, in step ③ above take the following measure:
- If the leak stops when the piping connections are tightened further, continue working from step ③.
- If the leak does not stop when the connections are retightened, repair the location of leak.
- Do not release refrigerant during piping work for installation and reinstallation. Take care of the liquid refrigerant, it may cause frostbite.

9.3.4. OUTDOOR UNIT ELECTRICAL WIRING

1. Remove Top panel.
2. Remove Control Board Cover.
3. Remove Plugs.
4. Fix the conduit connectors to the conduit holes with lock-nuts, then secure them.
5. Connecting wire between indoor unit and outdoor unit should be UL listed or CSA approved 4 x AWG16 wire.
6. Secure the wire onto the control board with the holder (clamper).
7. Wire connection to the power supply (208/230V 60Hz) through circuit breaker.
   - Connect the UL listed or CSA approved wires (AWG12) to the terminal board, and connect to other end of the wires to circuit breaker.
8. After completing wiring connections, reattach the control board cover and the top panel to the original position with the screws.





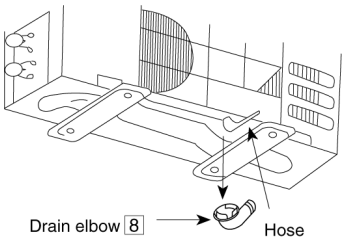
Note: Secure the wires onto the control board with the holder (Clamper)

9.3.5. PIPE INSULATION

1. Please carry out insulation at pipe connection portion as mentioned in Indoor/Outdoor Unit Installation Diagram. Please wrap the insulated piping end to prevent water from going inside the piping.
2. If drain hose or connecting piping is in the room (where dew may form), please increase the insulation by using POLY-E FOAM with thickness 1/4” or above.

9.3.6. DISPOSAL OF OUTDOOR UNIT DRAIN WATER

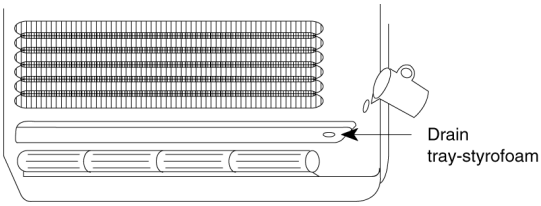
- If a drain elbow is used, the unit should be placed on a stand which is taller than 1-3/16”.
- If the unit is used in an area where temperature falls below 32°F for 2 or 3 days in succession, it is recommended not to use a drain elbow, as the drain water freezes and the fan will not rotate.



Install the hose at an angle so that the water smoothly flows out.

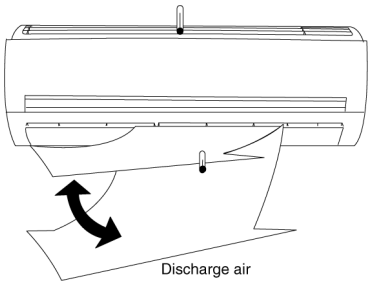
9.3.7. CHECK THE DRAINAGE

- Open front panel and remove air filters.
  (Drainage checking can be carried out without removing the front grille.)
- Pour a glass of water into the drain tray-styrofoam.
- Ensure that water flows out from drain hose of the indoor unit.



9.3.8. EVALUATION OF THE PERFORMANCE

- Operate the unit at cooling operation mode for fifteen minutes or more.
- Measure the temperature of the intake and discharge air.
- Ensure the difference between the intake temperature and the discharge is more than 46.4°F.



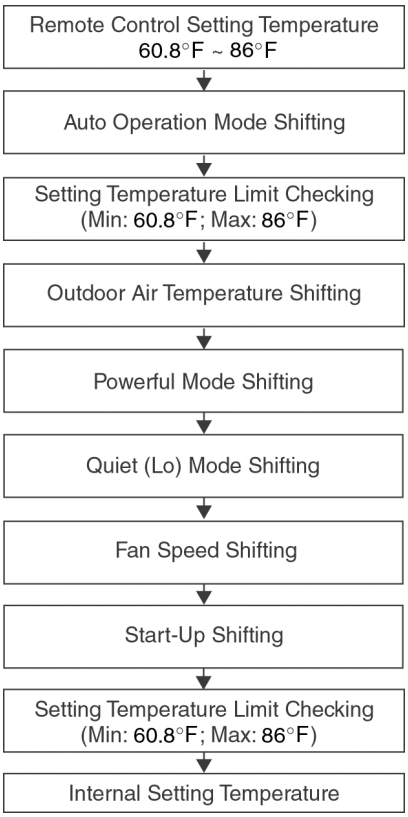
10 Operation And Control

10.1. Basic Function

Inverter control, which equipped with a microcomputer in determining the most suitable operating mode as time passes, automatically adjusts output power for maximum comfort always. In order to achieve the suitable operating mode, the microcomputer maintains the set temperature by measuring the temperature of the environment and performing temperature shifting. The compressor at outdoor unit is operating following the frequency instructed by the microcomputer at indoor unit that judging the condition according to internal setting temperature and intake air temperature.

10.1.1. Internal Setting Temperature

Once the operation starts, remote control setting temperature will be taken as base value for temperature shifting processes. These shifting processes are depending on the air conditioner settings and the operation environment. The final shifted value will be used as internal setting temperature and it is updated continuously whenever the electrical power is supplied to the unit.



10.1.2. Airflow Direction

1. There are two types of airflow, vertical airflow (directed by horizontal vane) and horizontal airflow (directed by vertical vanes).
2. Control of airflow direction can be automatic (angles of direction is determined by operation mode, heat exchanger temperature and intake air temperature) and manual (angles of direction can be adjusted using remote control).

10.1.2.1. Vertical Airflow

Operation Mode	Airflow Direction		Vane Angle (°)				
			1	2	3	4	5
Heating	Auto with Heat Exchanger Temperature	A	16				
		B	50				
		C	8				
		D	8				
	Manual		8	17	33	49	60
Cooling, Soft Dry	Auto		8 ~ 38				
	Manual		8	17	25	33	38
Mode Judgment in Auto	Auto		8				
	Manual		8	17	25	33	38

1. Automatic vertical airflow direction can be set using remote control; the vane swings up and down within the angles as stated above. For heating mode operation, the angle of the vane depends on the indoor heat exchanger temperature as Figure 1 below. When the air conditioner is stopped using remote control, the vane will shift to close position.

2. Manual vertical airflow direction can be set using remote control; the angles of the vane are as stated above and the positions of the vane are as Figure 2 below. When the air conditioner is stopped using remote control, the vane will shift to close position.

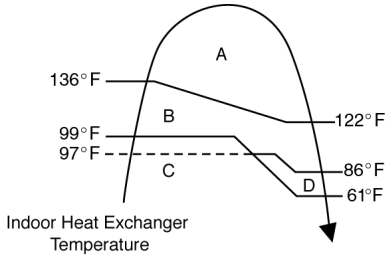


Figure 1

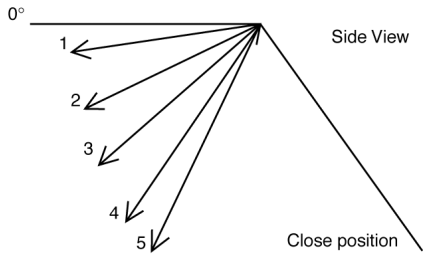


Figure 2

10.1.2.2. Horizontal Airflow

1. Automatic horizontal airflow direction can be set using remote control; the vane swings left and right within the angles as stated below. For heating mode operation, the angle of the vane depends on the indoor heat exchanger temperature as Figure 1 below.

Operation Mode		Vane Angle (°)
Heating, with heat exchanger temperature	A	68 ~ 112
	B	90
Cooling, Soft Dry		68 ~ 112

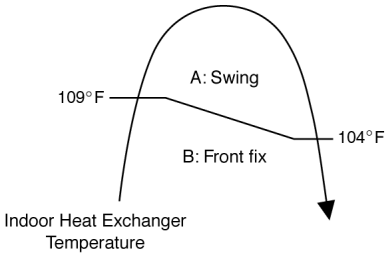


Figure 1

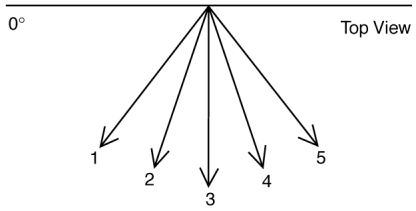


Figure 2

2. Manual horizontal airflow direction can be set using remote control; the angles of the vane are as stated below and the positions of the vane are as Figure 2 above.

Pattern	1	2	3	4	5
Airflow Direction Patterns at Remote Control					
Vane Angle (°)	90	68	79	101	112

10.1.3. Quiet operation (Cooling Mode/Cooling area of Soft Dry Mode)

A. Purpose

To provide quiet cooling operation compare to normal operation.

B. Control condition

a. Quiet operation start condition

- When “quiet” button at remote control is pressed.

  Quiet LED illuminates.

b. Quiet operation stop condition

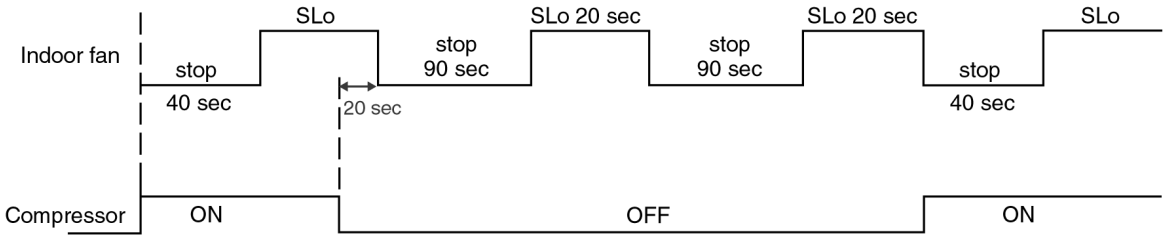
1. When one of the following conditions is satisfied, quiet operation stops:
   a. Powerful button is pressed.
   b. Stop by OFF/ON switch.
   c. Timer “off” activates.
   d. Quiet button is pressed again.
2. When quiet operation is stopped, operation is shifted to normal operation with previous setting.
3. When fan speed is changed, quiet operation is shifted to quiet operation of the new fan speed.
4. When operation mode is changed, quiet operation is shifted to quiet operation of the new mode.
5. During quiet operation, if timer “on” activates, quiet operation maintains.
6. After off, when on back, quiet operation is not memorised.

C. Control contents

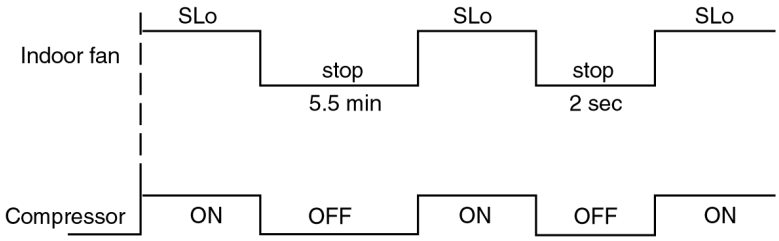
1. Fan speed is changed from normal setting to quiet setting of respective fan speed.
   This is to reduce sound of Hi, Me, Lo for 3dB.
2. Fan speed for quiet operation is -1 step from setting fan speed.

10.1.3.1. Quiet operation under Soft Dry operation (Dry area at Soft Dry Mode)

Automatic Fan Speed (Dry operation)



Manual Fan Speed (Soft dry operation)



10.1.3.2. Quiet operation (Heating)

A. Purpose

To provide quiet heating operation compare to normal operation.

B. Control condition

a. Quiet operation start condition

- When “quiet” button at remote control is pressed.
  Quiet LED illuminates.

b. Quiet operation stop condition

1. When one of the following conditions is satisfied, quiet operation stops:

a. Powerful button is pressed.
b. Stop by OFF/ON switch.
c. Timer “off” activates.
d. Quiet button is pressed again.

2. When quiet operation is stopped, operation is shifted to normal operation with previous setting.
3. When fan speed is changed, quiet operation is shifted to quiet operation of the new fan speed.
4. When operation mode is changed, quiet operation is shifted to quiet operation of the new mode, except fan only mode.
5. During quiet operation, if timer “on” activates, quiet operation maintains.
6. After off, when on back, quiet operation is not memorised.

C. Control contents

a. Fan Speed manual

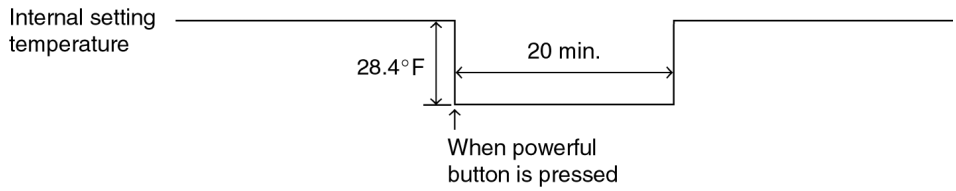
1. Fan speed is changed from normal setting to quiet setting of respective fan speed.
   This is to reduce sound of Hi, Me, Lo for 3dB.
2. Fan speed for quiet operation is -100 rpm from setting fan speed.
3. Fan Speed Auto
   - If FM ≥ Lo
     -100 rpm reduce from normal Heating Auto Fan Speed
   - If FM < Lo
     maintain RPM

   Indoor FM RPM depends on pipe temp sensor of indoor heat exchanger.

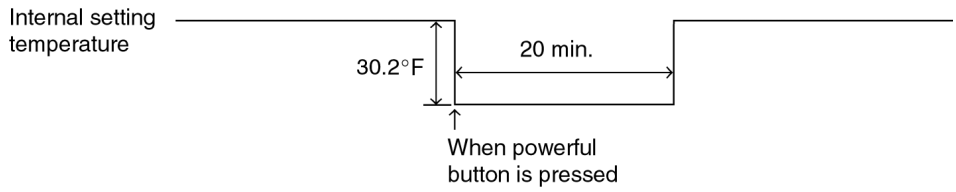
10.1.4. Powerful Mode Operation

When the powerful mode is selected, the internal setting temperature will shift to achieve the setting temperature quickly.

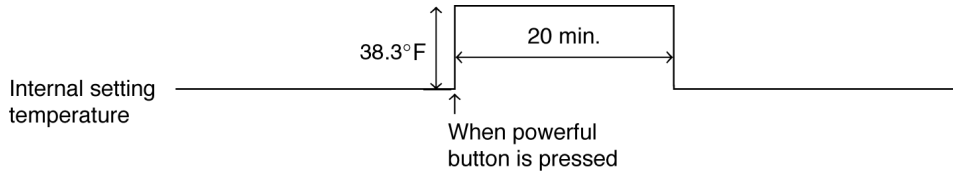
(a) Cooling Operation



(b) Soft Dry Operation



(c) Heating Operation

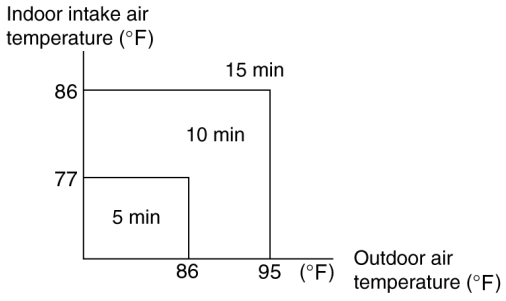


10.1.5. ON Timer Control

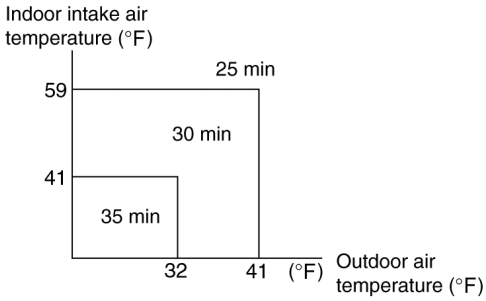
ON timer can be set using remote control, the unit with timer set will start operate earlier than the setting time. This is to provide a comfortable environment when reaching the set ON time.

60 minutes before the set time, indoor (at fan speed of Lo-) and outdoor fan motor start operate for 30 seconds to determine the indoor intake air temperature and outdoor air temperature in order to judge the operation starting time.

From the above judgment, the decided operation will start operate earlier than the set time as shown below.



Cooling/Soft Dry



Heating

10.1.6. OFF Timer Control

OFF timer can be set using remote control, the unit with timer set will stop operate at set time.

10.1.7. Auto Restart Control

1. When the power supply is cut off during the operation of air conditioner, the compressor will re-operate within three to four minutes (there are 10 patterns between 2 minutes 58 seconds and 3 minutes 52 seconds to be selected randomly) after power supply resumes.
2. This type of control is not applicable during ON/OFF Timer setting.

10.2. Protection Control

10.2.1. Time Delay Safety Control

- Compressor will not start for three minutes after stop of the operation.

10.2.2. 30 Seconds Forced Operation

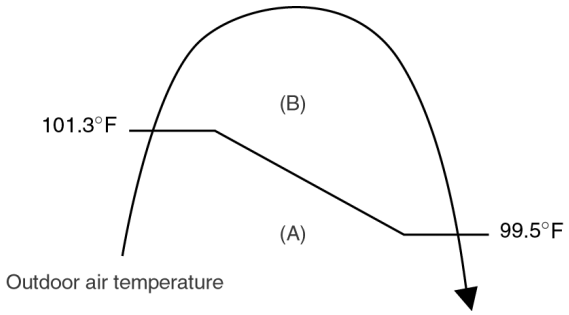
- Once compressor starts the operation, it will not stop its operation for 30 seconds. However, it can be stopped with the remote controller or the Auto button on the indoor unit.

10.2.3. Total Running Current Control

1. When the outdoor unit total running current (AC) exceeds X value, the frequency instructed for compressor operation will be decreased.
2. If the running current does not exceed X value for five seconds, the frequency instructed will be increased.
3. However, if total outdoor unit running current exceeds Y value, compressor will be stopped immediately for three minutes.

	E21EK		E18EK	
Operation Mode	X (A)	Y (A)	X (A)	Y (A)
Cooling/Soft Dry (A)	11.0	15.0	8.8	15.0
Cooling/Soft Dry (B)	9.6	15.0	7.7	15.0
Heating	11.5	17.0	10.8	17.0

4. The first 30 minutes of cooling operation, (A) will be applied.



10.2.4. IPM (Power transistor) Protection Control (DC Peak detection)

Abnormal Current Control

- If inverter load current (DC peak) exceeds a rated value, compressor will be stopped immediately. When the excess occurs within 30 seconds after operation, it restarts in 1 minute and when after 30 seconds, restarts in 2 minutes.
- If the excess continuously occurs 7 times within 30 minutes after compressor starts, the unit will be stopped and timer LED on the indoor unit will be blinking. (“F99” is to be confirmed.)

IPM Overheating Prevention Control

- If temperature of IPM exceeds 217°F, compressor will be stopped. It will restart in 2 minutes. Temperature for restarting: 194°F.
- If the excess occurs 4 times within 30 minutes after compressor starts, the compressor will be stopped and timer LED on the indoor unit will be blinking. (“F96” is to be confirmed.)

10.2.5. Compressor Overheating Prevention Control

1. If discharge pipe temperature exceeds 212°F, compressor power will be limited.
2. If discharge pipe temperature exceeds 233°F, compressor will be stopped.
3. If the above excess occurs 4 times per 10 minutes, timer LED will be blinking. (“F97” is to be confirmed.)

10.2.6. Outdoor High Pressure Prevention Control (Cooling and Soft Dry Operations)

1. If outdoor heat exchanger temperature exceeds 145°F in cooling or soft dry operation, compressor will be stopped.
2. Timer LED is not blinking. (“F95” is memorized, then.)

10.2.7. Compressor Protection Control (Refrigeration Cycle Abnormality)

In cooling and Dry operations

1. When compressor is operated continuously for 5 minutes in the maximum cooling power: a running current of 0.7 - 1.4A and “[Indoor intake air temperature] - [Indoor heat exchanger temperature]” < 7.2°F, compressor will be stopped.
2. If the above excess occurs twice for 20 minutes, timer LED is to be blinking. (“F91” is to be confirmed.)

In Heating operation

1. When compressor is operated continuously for 5 minutes in the rated heating power: a running current of 0.7 - 1.4A and “[Indoor heat exchanger temperature] - [Indoor intake air temperature]” < 9°F, compressor will be stopped.
2. If the above excess occurs twice for 20 minutes, timer LED is to be blinking. (“F91” is to be confirmed.)

10.2.8. Four-way Valve Operation Detection Control (Switching Abnormality between Cooling and Heating)

In Cooling operation

1. When indoor heat exchanger temperature exceeds 113°F in 4 minutes after compressor starts, compressor will be stopped.
2. If the above excess occurs 4 times per 30 minutes, timer LED is to be blinking. (“F11” is to be confirmed.)

In Heating operation

1. When indoor heat exchanger temperature is below 32°F in 4 minutes after compressor starts, compressor will be stopped.
2. If the above excess occurs 4 times per 30 minutes, timer LED is to be blinking. (“F11” is to be confirmed.)

10.2.9. Freeze Prevention Control (Cooling and Soft Dry Operations)

Limit of Cooling power

1. When temperature of indoor heat exchanger is below 41°F, operating frequency will be decreased.
2. When temperature of indoor heat exchanger exceeds 44°F, operating frequency will be increased. (But, up to programmed frequency.)
3. When temperature of indoor heat exchanger is below 32°F continuously for 6 minutes, compressor will be stopped.
4. Timer LED is not blinking. (“F99” is memorized, then.)

Limit of Indoor fan speed

- When temperature of indoor heat exchanger is below 43°F (36°F at Soft dry) continuously for 6 minutes, indoor fan speed will be increased by 50 rpm.

10.2.10. Outdoor Air Temperature Control

In Cooling and Dry operations

1. When outdoor air temperature is below 77°F, the maximum power will be limited up to about 80 - 100% of the rated power.
2. When outdoor air temperature is below 64°F, the maximum power will be limited up to about 50 - 100% of the rated power.
3. When outdoor air temperature is below 52°F, the maximum power will be limited up to about 26 - 81% of the rated power.

10.2.11. Indoor Intake Air Temperature Control (Heating operation)

1. When indoor air temperature is 95°F or more, the maximum power will be limited up to the rated power.
2. When fan speed is set at “Lo” and intake air temperature is below 70°F, the maximum power will be limited up to the rated power.

11 Servicing Mode

11.1. Auto Switch Operation

The below operations will be performed by pressing the “AUTO” switch.

1. AUTO OPERATION MODE

   The Auto operation will be activated immediately once the Auto Switch is pressed and release before 5 sec..

2. TEST RUN OPERATION (FOR PUMP DOWN/SERVICING PURPOSE)

   The Test Run operation will be activated if the Auto Switch is pressed continuously for more than 5 sec. to below 8 sec. A “beep” sound will occur at the fifth sec., in order to identify the starting of Test Run operation.

3. HEATING TRIAL OPERATION

   Press the AUTO switch continuously for more than 8 sec. to below 11 sec. and release when a “pep pep” sound is heard at eight sec. (However, a “beep” sound is occurred at fifth sec..) then press Remote controller “A/C Reset” button once. Remote controller signal will activate operation to force heating mode.

4. REMOTE CONTROLLER RECEIVING SOUND ON/OFF

   The ON/OFF of Remote controller receiving sound can be change over by following steps:

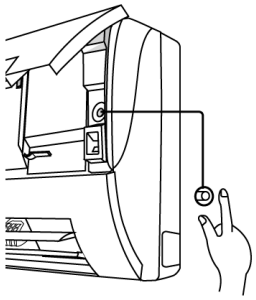
   a. Press “AUTO” Switch continuously for more than 16 sec. to below 21 sec.

      A “beep”,“beep”,“beep”,“beep” sound will occur at the sixteenth sec..

   b. Press the “A/C Reset” button once. Remote controller signal will activate the Remote controller sound setting mode.

   c. Press the “Check” button once at Remote controller. A “beep” sound will occur.

   d. Press the “AUTO” switch once to select Remote controller receiving sound ON/OFF. A “beep” sound indicates receiving sound ON, and a long “beep” sound indicates receiving sound OFF.



11.2. Indicator Panel

(green) (orange) (orange) (orange)

POWER TIMER QUIET POWERFUL

LED	POWER	TIMER	QUIET	POWERFUL
Color	Green	Orange	Orange	Orange
Light ON	Operation ON	Timer Setting ON	Quiet Mode ON	Powerful Mode ON
Light OFF	Operation OFF	Timer Setting OFF	Quiet Mode OFF	Powerful Mode OFF

Note:

- If POWER LED is blinking, the possible operations of the unit are Hot Start, during Deice operation, operation mode judgment, or ON timer sampling.
- If Timer LED is blinking, there is an abnormality operation occurs.